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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/929,833

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Paolo Arena

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06/01/2005

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EXAMINER

JOHNS, ANDREW W

ART UNIT

PAPER NUMBER

2621

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/929,833

Applicant(s)

ARENA ET AL.

Examiner

Andrew W. Johns

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 November 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-65 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 50-65 is/are allowed.
- 6) ☒ Claim(s) 20-34, 38-44 and 46-49 is/are rejected.
- 7) ☒ Claim(s) 35-37 and 45 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 November 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 22 November 2004 have been fully considered but they are not persuasive.

5 Applicant argues that Shams et al. is directed towards a digital image processing based system that captures and analyzes digital images of the DNA microarray, while the cellular neural network (CNN) of Chua et al. is defined as an analog processing system that utilizes analog input signals. Applicant concludes that this disparity between the digital system of Shams et al. and the analog system of Chua et al. leaves no motivation to combine the two
10 teachings.

However, the use of digital-to-analog converters is exceedingly well known in the art, and it would be well within the ability of one of ordinary skill in the art to use such a D/A converter to transform the digital images of Shams et al. into an analog format compatible with the CNN of Chua et al. The combination of the references in a rejection under 35 U.S.C. § 103
15 is not a literal combination of the disclosed systems, but rather is the understanding reached by one of ordinary skill in the art based on the teachings of the references as a whole, taken together with the common knowledge in the art. In the instant case, Chua et al. suggests certain advantages of cellular neural networks that would motivate one of ordinary skill in the art to use such networks in other analysis systems, including that of Shams et al.

20 Applicant further argues that the examiner has used impermissible hindsight to arrive at the combination. However, the examiner pointed out three specific advantages of using cellular neural networks (specifically, they provide high-speed processing, they act on the image in real-time, and they provide stable recognition results; see the previous Office Action, page 4, lines

19-21). Because these advantages are specifically suggested by Chua et al., the prior art itself provides ample motivation for the combination set forth in the rejection of the claims.

Finally, if applicant's argument that the teachings of Shams et al. and Chua et al. cannot be combined because Shams et al. is a digital system while the CNN of Chua et al. is analog were to be found persuasive, it would raise an issue of the scope of the enablement with respect to claims 20 and 46. Each of these claims broadly encompasses sensors that acquire digital signals which would be input into the cellular neural network, which is, by definition, an analog device. Since the disclosure only describes acquiring analog signals, claims 20 and 46 are fully enabled *only* if the conversion of such digital signals to appropriate analog signals is readily apparent to one of ordinary skill in the art.

Therefore, it is believed that one of ordinary skill in the art would find the claimed invention obvious, given the teaching of the references, as a whole, and the general knowledge in the art.

Drawings

2. The drawings are objected to because, while the content of the newly added legends is acceptable, the characters of the legends added to Figures 2 and 7 are not uniformly thick and well formed so as to give them satisfactory reproduction characteristics, as required by 37 C.F.R. § 1.84(l). Corrected drawing sheets in compliance with 37 C.F.R. § 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the

remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 C.F.R. § 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Double Patenting

3. Claims 35 and 36 are objected to under 37 C.F.R. § 1.75 as being a substantial duplicate of claims 50 and 58. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See M.P.E.P. § 706.03(k).

Claim Rejections - 35 U.S.C. § 103

4. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 20-32, 34, 38-44 and 46-49 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Shams et al. (US 6,731,781 B1), in view of Chua et al. (US 5,140,670 A).

Shams et al. teaches a system and method for analyzing an image of a DNA microarray (column 6, lines 32-46), including acquiring at least one signal corresponding to the image of the

DNA microarray with a sensor (column 9, lines 14-16), and processing the at least one signal in a processor (column 9, lines 30-40), as variously required by claims 1, 42 and 46. In addition, Shams et al. further teaches that the sensor acquires signals corresponding to a fluorescence image of the DNA microarray (column 9, lines 22; the scanner is a “fluorescent” scanner; also
5 note Figure 1; the cells are labeled with fluorescent dyes), as additionally required by claims 23, 43 and 48; that the sensor is a matrix color sensor (i.e., it generates a two dimensional pixel array; column 9, line 17; and includes both a red channel and a green channel, as shown in Figure 1), as variously required by claims 26 and 27; the sensor comprising an optical sensor responsive to a predetermined set of chromatic components of the image of the DNA microarray
10 and the set excludes blue chromatic components (i.e., the sensor is responsive to the Red and Green chromatic components, as shown in Figure 1, which are mutually exclusive of blue components), as variously stipulated by claims 28-30 and 49; that the processor performs at least one of background clearing of the image (column 16, lines 44-46), grid analysis of the image (501 in Figure 5), elimination of smaller irregular spots associated with the image, elimination of
15 larger spots associated with the image, intensity analysis (806 in Figure 8), and threshold definition (column 16, lines 17-42), as required by claim 34; and, finally, a memory for storing signals corresponding to the image of the DNA microarray (column 10, lines 1-2) and control logic for processing the signals in real-time (column 9, lines 41-45), as set forth in claim 38.

However, Shams et al. fails to specifically teach that the processor is a cellular neural
20 network (CNN), as further required by claims 20, 42 and 46; that the signals representing the image are analog signals, as stipulated by claims 22, 42-44 and 46; that the signals are processed by the CNN in parallel as variously defined in claims 21, 31 and 47; that the CNN include an array of processing cells with synaptic connections interconnecting the cells, as also required by

claims 24 and 44; or that the array of cells have a spatial distribution correlated to the image, as further defined by claims 25 and 44. Finally, Shams et al. also fails to teach that the sensor and processor can be integrated onto a single chip, as defined in claim 32; or that the image is processed in accordance with a plurality of CNN parameters, as variously stipulated by claims 39-41.

Chua et al. teaches a system and method for using a cellular neural network (CNN) to analyze image data (column 15, lines 56-57), and further teaches that such networks operate on analog image signals (column 23, lines 54-56) in parallel (column 3, lines 51-52) using an array of interconnected cells (column 3, line 63 through column 64, line 1) that has the same spatial distribution as the image (column 24, lines 53-56). Chua et al. also teaches that the sensor and the CNN can be implemented on a single integrated circuit chip (column 24, lines 58-61). Finally, Chua et al. also teaches the use of a number of CNN parameters in processing the image data (column 20, lines 1-10).

Because the CNN described by Chua et al. provides for high-speed processing (column 3, lines 51-52) and because the CNN can act on the image as it is input (column 25, lines 4-7) and provides stable recognition responses (column 2, lines 46-49), it would have been obvious to one of ordinary skill in the art to use the CNN of Chua et al. to perform the image analysis operations of Shams et al. to provide for high-speed, highly accurate image analysis results. While the CNN of Chua et al. requires the input of analog signals, the use of digital-to-analog converters to generate analog signals corresponding to a set of digital signals is well within the ability of the person of ordinary skill in the art, so that the use of such a D/A converter to convert the digital images of Shams et al. into an analog format compatible with the CNN of Chua et al. would have been a readily apparent modification that would allow one of ordinary skill in the art to use the

CNN to perform the analysis of Shams et al. so as to gain the advantages of such CNN processing. Therefore, the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention.

6. Claim 33 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Shams et al.
5 and Chua et al. as applied to claims 20-32, 34, 38-44 and 46-49 above, and further in view of Roska et al. (Article entitled "Review of CMOS Implementations of the CNN..." from the 2000 *IEEE Int. Symp. On Circuits and Systems*).

While Shams et al. and Chua et al. variously teach or suggest a number of the limitations of the claimed invention, as pointed out more fully above, Neither Shams et al., nor Chua et al.
10 specifically teaches that the sensor or CNN can be implemented as a CMOS device, as further required by claim 33.

7. Roska et al. teaches that CNN's and sensors can be implemented in CMOS (see the title, for example). Because these devices provide very high processing rates and low power consumption (lines 16-17 of the abstract), it would have been obvious to one of ordinary skill in
15 the art that the devices of Chua et al. could be implemented in CMOS to provide highly efficient processing capabilities. Therefore, the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention.

Allowable Subject Matter

8. Claims 50-65 are allowed.

20 9. Claims 37 and 45 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. § 1.136(a).

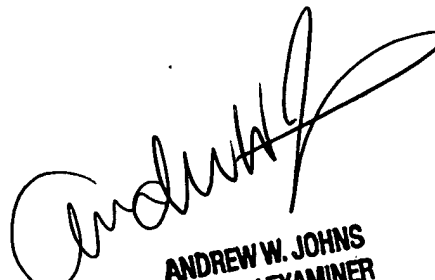
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 C.F.R. § 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Johns whose telephone number is (571) 272-7391. The examiner is normally available Monday through Friday, at least during the hours of 9:00 am to 3:00 pm Eastern Time. The examiner may also be contacted by e-mail using the address: andrew.johns@uspto.gov. (Applicant is reminded of the Office policy regarding e-mail communications. See M.P.E.P. § 502.03)

If attempts to reach the examiner are unsuccessful, the examiner's supervisor, Joseph Mancuso, can be reached at (571) 272-7695. The fax phone number for this art unit is (703) 872-9306. In order to ensure prompt delivery to the examiner, all unofficial communications should be clearly labeled as "Draft" or "Unofficial."

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center Receptionist whose telephone number is (571) 272-2600.

A. Johns
26 May 2005



ANDREW W. JOHNS
PRIMARY EXAMINER